

DECISION TOOL -- A Graphical User Interface for Generic Markov Models

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INTRODUCTION

Markov modeling has become increasingly popular for medical decision analysis because it captures the interaction of events over time[1]. Unfortunately, Markov models are difficult to construct and debug, creating a barrier to their use in supporting patient care and health policy decision making. The availability of a generic Markov model to use as a template to frame a set of similar medical problems would simplify the use of such models in medical decision making and would enable users to capture the dynamics of a group of related medical problems without constructing a *de novo* model and without requiring the end user to become an expert in constructing decision models.

Much of the available software for medical decision making uses a command line or menu driven interface and is designed for decision tree construction [2, 3]. Because analysts who wish to use these generic templates may not be expert computer users, a graphical user interface would facilitate Markov model generation and decrease errors. Restricting the editing capabilities would prevent users from introducing errors to an existing tree by inappropriate modification. To test these hypotheses, a generic Markov decision tree and interface has been constructed to evaluate the cost-effectiveness of a variety of screening tests for newborns.

DESCRIPTION

We developed DECISION TOOL using Visual Basic 3.0 for Microsoft Windows, which allows integration of spreadsheet and graph components, Windows API (application programming interface) calls, as well as relational database commands. The decision tree was constructed using DECISION MAKER 7.0. DECISION TOOL consists of a main window, an editing window, and a results window. A translator is provided for converting between a tree in DECISION MAKER format and a tree in DECISION TOOL's relational database format, which is compatible with the Microsoft Access relational database. This allows database storage of both decision tree information and results of the analysis. Decision trees constructed using SMLTREE are also compatible with DECISION TOOL.

The main window contains both menu and tool bar access to all of the program's functions, including file management functions, DECISION MAKER calls, data editing, and simulation results. This window includes a spreadsheet which allows

viewing of those parts of the decision tree which can be edited. DECISION TOOL calls DECISION MAKER to run a simulation.

Selected information in the model can be edited. Tree node names may be changed; comments can be added. Most variables can be changed in value, or can be changed to lookup a value in an indexed table, or to use an arbitrary expression or function. Variables represented by functions or tables can be graphed to facilitate the elicitation of subjective values from the user.

We developed a Markov cost-effectiveness model for neonatal screening which considers age at detection, severity of chronic illness, presence of an acute illness, compliance with therapy, and presence of another chronic illness using 63 states of health. The model contains 790 bindings, 169 nodes and 317 variables. Physicians not familiar with Markov modeling were able to instantiate the model and perform sensitivity analyses which examined neonatal screening for phenylketonuria, sickle cell anemia, and cystic fibrosis.

CONCLUSION

The ability to design a generic template model and provide a graphical user interface should facilitate the use of Markov models by users who are not decision analysts. We have developed such a generic Markov model for neonatal screening and have applied it to policy decisions facing a department of public health.

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